

Oklahoma Outbreak Summary

NWSFO Norman, Oklahoma

Summary of Warning and Forecast Services

The potential for severe weather in Oklahoma was reflected in National Weather Service forecast products as much as 36 hours prior to the outbreak. The May 2 SPC Day 2 SWO (valid May 3) and the May 3 Day 1 SWO predicted a slight risk for severe weather. At 6:30 a.m. on May 3, NWSFO Norman issued a Thunderstorm Outlook, noting a slight risk of severe storms in western and central Oklahoma that afternoon and night. It mentioned the increasing low-level moisture, dryline and approaching upper-level low pressure trough would combine to cause a threat of hail, damaging winds and isolated tornadoes. It also cautioned emergency managers and spotter groups to be prepared for possible activation in the afternoon.

Forecasts later that day advertised an increasing possibility of severe storms. The 11 a.m. SPC Day 1 Outlook upgraded much of the eventual outbreak area to a moderate risk, as did the 12:30 p.m. Thunderstorm Outlook issued by NWSFO Norman. The increasing risk was further reflected when the 3:49 p.m. SPC Day 1 Outlook upgraded the risk once again—this time to a high risk.

The Norman NWSFO issued the first severe thunderstorm warning (SVR) of this event at 4:15 p.m. Soon after, the SPC issued Tornado Watch #195 for western and central Oklahoma, valid from 4:45 p.m. until 10 p.m. The first tornado warning was issued at 4:47 p.m. About 10 hours later, after the main part of this event concluded, NWSFO Norman had issued 70 tornado warnings and 46 severe thunderstorm warnings for 32 of the 56 counties within its county warning area (CWA) (see product chronology highlights in Appendix C).

The Norman Office of the National Weather Service was very successful in giving the public significant advance warning of the individual tornadoes. They achieved a remarkable 32-minute lead-time average for the first tornado warning issued in each of the Oklahoma City metropolitan area counties that was affected by the F5 tornado. Warnings for this Oklahoma City F5 tornado, which hit Grady, McClain, Cleveland and Oklahoma Counties, were issued with lead times of 65, 18, 31 and 13 minutes, respectively.

These excellent lead times were a function of several factors. These included very good severe weather knowledge and radar interpretation skills, modernized National Weather Service equipment (especially the WSR-88D and the Advanced Weather Interactive Processing System [AWIPS]), a well-trained and widespread spotter network and the long-lived nature of several of the tornadoes. Another factor, cited by the NWSFO staff, was the use of “sectorized” warning operations. The use of multiple AWIPS workstations, all with the same data and capabilities, permitted forecasters to divide warning responsibility by geographic area. This geographic division of responsibility improved efficiency and warning strategy during this widespread

outbreak. The NSSL-developed Warning Decision Support System (WDSS) software also proved to be a useful tool during this event.

In addition to its excellent National Weather Service warnings, NWSFO Norman kept the public informed with numerous SVSs, NOWs and Local Storm Reports (LSRs). During the most active period of this event (4 p.m. until midnight), they issued 48 concise SVSs, 9 NOWs and 14 LSRs.

At 5:41 p.m., a NOW was issued alerting the Oklahoma City metropolitan area of severe thunderstorms and possible tornadoes. In part, this NOW read,

SEVERE THUNDERSTORMS...SOME PRODUCING TORNADOES...WILL MOVE NORTHEAST ACROSS PORTIONS OF SOUTHWEST AND CENTRAL OKLAHOMA THROUGH 6:30 PM.

This NOW went on to state,

THE STORMS WILL BE MOVING TOWARD THE OKLAHOMA CITY METROPOLITAN AREA. IN ADDITION TO VERY LARGE HAIL AND DAMAGING WINDS...THESE STORMS MAY ALSO CONTINUE TO PRODUCE TORNADOES. IF YOU ARE IN THE PATH OF THE THUNDERSTORMS...EXERCISE YOUR TORNADO SAFETY PROCEDURES!

To heighten awareness of the severity of the situation, the office alarmed several SVSs on NWR and issued an effective SVS at 6:57 p.m. that included the words “**TORNADO EMERGENCY**” in the headline. Following is a portion of that SVS:

...TORNADO EMERGENCY IN SOUTH OKLAHOMA CITY METRO AREA...

AT 657 P.M .CDT...A LARGE TORNADO WAS MOVING ALONG INTERSTATE 44 WEST OF NEWCASTLE. ON ITS PRESENT PATH...THIS LARGE DAMAGING TORNADO WILL ENTER SOUTHWEST SECTIONS OF THE OKLAHOMA CITY METRO AREA BETWEEN 715 P.M. AND 730 P.M. PERSONS IN MOORE AND SOUTH OKLAHOMA CITY SHOULD TAKE IMMEDIATE TORNADO PRECAUTIONS!

THIS IS AN EXTREMELY DANGEROUS AND LIFE THREATENING SITUATION.

All NWS warnings, forecasts and statements were disseminated via the NWWS, NWR, FOS, EAS, NAWAS, the local amateur radio network, and the Emergency Managers Weather Information Network (EMWIN). NWS information was also disseminated by local television and radio stations, as well as through the Internet and OK-FIRST (Oklahoma’s First-response Information Resource System using Telecommunications).

Two situations developed that could have impacted NWS warning services, but did not, thanks to a competent staff and pre-existing agreements. First, a number of warnings were not automatically sent through the Console Replacement System (CRS) to the NWR. Of the 72 warnings that were issued within NWR listening areas, 14 (19 percent) had to be done manually with only slight delays. The causes of most of the malfunctions were traced back to software issues with CRS/Airwave/Bubble (Airwave and Bubble are product formatting software which serve as an interface between AWIPS and CRS). Fixes for some of these problems were tested just days after the outbreak.

Second, telephone service, including cellular, was intermittent (at best) from around 6:30 p.m. until midnight—the duration of most of the outbreak. As the main tornadic storm approached NWSFO Norman, staff members used NAWAS to contact surrounding NWS offices to coordinate possible back-up support. Despite the lack of consistent phone service, numerous severe weather reports continued to flow into the NWSFO thanks to spotters, amateur radio operators and NAWAS.

Public Response

The fact that casualties were low (compared to the many thousands that were affected by the main Oklahoma City tornado) is, in large part, attributable to the effective response of the public to early National Weather Service severe weather warnings. To help enhance public response, the Norman NWSFO has conducted an aggressive preparedness campaign for years in Oklahoma. Within the 3 months prior to the outbreak, 32 spotter training classes were held. In the 5-month period leading up to the outbreak, the office hosted 9 tours, conducted 4 safety presentations, participated in 3 televised safety shows and presented 2 safety displays (information booths) within its CWA. The office also has been active in the state's annual severe weather awareness week.

Oklahoma City radio and television stations also played a crucial role that led to effective public response. They rapidly communicated National Weather Service warnings and gave hours of live coverage of spotter reports, aerial video and ground-level video of the tornadoes. Using the cable television override capability, the Moore City Emergency Manager broadcast NWS warnings (audio only) to the community. Many radio stations provided simulcasts of the live telecasts from the three primary television stations, as the main tornado approached the Oklahoma City metropolitan area. One television station urged people to get out of the path of this destructive tornado. This statement was cited as one of the reasons many people fled the path of the tornado, only to return to damaged or demolished property. It should be noted that fleeing a tornado is not recommended but was effective in this particular event due to lengthy National Weather Service warning lead times, as well as the tornado's intensity and longevity.

Post-Storm Feedback

Positive feedback after the outbreak was overwhelming. Local and national news coverage often mentioned the advance warning provided by the National Weather Service and live video coverage by Oklahoma City television stations. Interviews with a number of local radio stations indicated the NWR information was very helpful in their efforts to alert the public. After the event, NWSFO Norman issued a series of informative Public Information Statements (PNSs) on May 4 and 5. These statements provided considerable detail regarding tornado paths, preliminary intensities and comparisons to previous Oklahoma City tornadic events. In addition, NWSFO Norman, as well as the SPC and NSSL, posted photographs, preliminary tornado tracks, storm time lines and informative summaries on their Web pages which served as a source of information for the media and other users.

Emergency managers were pleased with the severe weather information supplied by various National Weather Service dissemination systems. Of special note was the Oklahoma Climatological Survey's (OCS) OK-FIRST, which emergency managers cited as a valuable tool during the outbreak. A large Oklahoma City business called the Norman NWSFO after the outbreak to express thanks for assistance in updating the company's safety plan prior to this event. Unlike the company's previous plan, the new plan instructed employees to seek shelter at that location rather than to drive away. Since the tornado passed close to this business, this change in the plan may have saved lives and prevented injuries.

The Norman NWSFO developed excellent working relationships with local emergency managers. The strong partnerships eased the communication process during the severe weather outbreak and also enabled NWS officials to gain access to the damaged areas to conduct surveys. Many of the severely damaged areas remained barricaded by the National Guard and/or local law enforcement until at least May 9, 1999.

Summary

This was a unique event. Despite the large number of tornadoes in the NWSFO Norman CWA and the tremendous devastation in residential areas, casualties were minimal for several reasons.

- < One very large tornado caused most of the damage and casualties.
- < National Weather Service tornado warnings were issued with long lead times.
- < There were live, on-the-scene broadcasts of the tornado on the local Oklahoma City television stations well before it reached the densely populated metropolitan area.
- < The main tornado struck in late afternoon and early evening after schools were out and most commuter traffic had reached its destination.

- < Residents were well-versed in tornado safety precautions due to extensive training and outreach by the National Weather Service, local news media and emergency management agencies.

Had this tornado struck during the late nighttime hours, even with the long National Weather Service tornado warning lead times, the number of casualties could have been much higher.

In summary, the public was very well served by the National Weather Service in Norman prior to and during this significant event. Effective warnings and follow-up statements minimized loss of life and property.



An F5 tornado wrapped a large 4-wheel drive pickup around a utility pole, stripping off most of the truck's sheet metal. (Photograph courtesy of Curtis Carey, NOAA/NWS Public Affairs)



F5 damage to a home in Moore, Cleveland County, Oklahoma, May 3, 1999. Note most debris has been blown away. (Photograph copyright 1999. The Oklahoma Publishing Co.)



Wooden projectiles driven into the ground by the tornado on the west side of Oklahoma City, Oklahoma, May 3, 1999. Note different directions of impact. (Photograph courtesy of William Lerner, NWS Headquarters)